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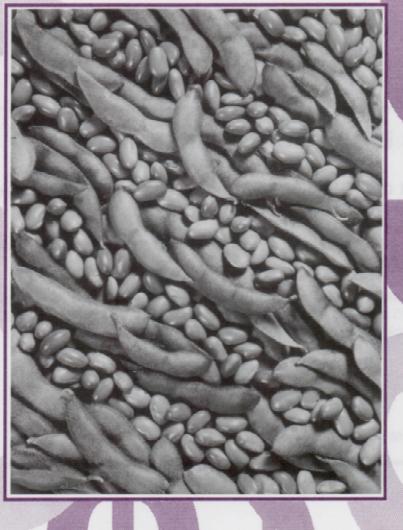
United States
Department of Agriculture

Economic Research Service

Agricultural Economic Report Number 668

An Alternative for Reducing Federal Crop Insurance Program Losses

Joseph W. Glauber Joy L. Harwood Jerry R. Skees



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An Alternative for Reducing Federal Crop Insurance Program Losses. By Joseph W. Glauber, Joy L. Harwood, and Jerry R. Skees. Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 668.

Abstract

The Federal crop insurance program saw indemnities exceed premiums by \$2.5 billion in the 1980's, a decade of widespread drought and rapid growth in insurance participation. This excess loss, after small surpluses for most of the Federal Crop Insurance Corporation's history, masks the wide variation in performance among crops and regions. More than half of program excess losses were for soybeans (mostly those produced in Arkansas, Georgia, Louisiana, and Mississippi) and wheat (mostly that produced in Montana and North Dakota). An alternative method of crop insurance, with payments based on yield losses in a geographic area rather than those experienced by individual producers, may help to reduce excess losses. A pilot program using such a method is being tested for soybeans.

Keywords: Crop insurance, FCIC, area-based, yield, excess loss, premiums, disaster assistance.

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Summary

The Federal crop insurance program experienced a period of excess losses (payouts exceeding premiums) in the 1980's, after achieving small surpluses for most of its history. Those excess losses (\$2.5 billion) mask the wide variation in performance among crops and regions. Soybeans and wheat claimed over half of excess losses for all crops in 1981-89. Arkansas, Georgia, Louisiana, and Mississippi accounted for 72 percent (\$424 million) of excess losses attributable to soybeans. Montana and North Dakota accounted for 60 percent (\$367 million) of wheat excess losses.

USDA's Federal Crop Insurance Corporation estimates that, between 1983-90, more than 40 percent of total excess soybean losses were concentrated in 1.4 percent of soybean policies. About 2 percent of wheat policies accounted for almost 20 percent of total wheat excess losses in 1983-89. Crop insurance losses tend to be concentrated geographically: wheat losses in Montana, soybean losses in the Delta States and the Southeast, and cotton and grain sorghum losses in the Texas High Plains.

This report outlines why insurance losses escalated in the 1980's, and describes how an alternative (area-based loss) program might stem those losses. Recent crop insurance reforms have aimed at charging higher premiums for policyholders with abnormal loss histories. An area-based loss program, by contrast to the current program, bases premiums and payouts not on an individual producer's yield, but on the aggregate yield of a surrounding region, the producer's county, for example. Payouts, if triggered, are based on the difference between the area yield and a predetermined yield guarantee. Each participant is charged the same premium (by amount of coverage) and receives the same payout per acre insured.

A theoretical analysis suggests that an area-based program would be most effective in providing risk protection in years of relatively high yield variability, as in the 1980's. A pilot area-based program is being tested for soybeans in 13 States that have experienced large crop insurance losses and low farmer participation.

An Alternative for Reducing Federal Crop Insurance Program Losses

Joseph W. Glauber Joy L. Harwood Jerry R. Skees

Introduction

In December 1988, the Office of Management and Budget (OMB) requested that the U.S. Department of Agriculture's Economic Research Service (USDA-ERS) evaluate the Federal crop insurance program. This is the second of two reports. The first report, Federal Crop Insurance and the 1990 Farm Bill: An Assessment of Program Options (Glauber, Harwood, and Miranda, 1989), evaluated alternatives to the current crop insurance program, including revenue insurance, free crop insurance, compulsory crop insurance, and disaster assistance. The study found that the costs of free crop insurance or disaster assistance would likely exceed the average \$1.1 billion spent annually during the 1980's on crop insurance and ad hoc disaster assistance. Conversely, the study also concluded that compulsory crop insurance or a target revenue program would result in lower costs than were spent on disaster programs in the 1980's.

In the debate leading up to passage of the Food, Agriculture, Conservation, and Trade Act of 1990 (the 1990 Act), many of these alternatives were proposed in various forms and subsequently rejected by Congress. In the 1990 Act, Congress eschewed major changes in the Federal crop insurance program and instead authorized the Federal Crop Insurance Corporation (FCIC) to continue the course it pursued in the 1980's. Provisions of Title XXII of the 1990 Act include the following (Public Law 101-624):

- FCIC is authorized to adopt rates and coverage that will improve the actuarial soundness of crop insurance policies.
 Premium rates not deemed actuarially sufficient may not be increased more than 20 percent per year from the previous year's comparable rates.
- Beginning in the 1992 reinsurance year (which started July 1, 1991), FCIC was to revise its reinsurance agreements so that reinsured companies bear an increased share of any potential loss.
- Innovative policy development is encouraged, such as insurance based on area losses, dollar-denominated coverage, and the use of adjusted program yields established by the U.S. Department of Agriculture's Agricultural Stabilization and Conservation Service.

The Managers intend that the crop insurance provisions in this Act do not represent an answer to the problems facing Federal crop insurance. A more fundamental restructuring is needed... Congress must address this problem soon ... in the 102nd Congress (U.S. Congress, 1990).

¹ According to the 1990 Act's conference report, the agricultural committees view the crop insurance provisions as an interim measure. The report notes that:

- All parties with 5 percent or more beneficial interest in a policy must submit their Social Security and employer identification numbers to FCIC.
- Any person intentionally providing false or inaccurate information may be fined up to \$10,000 and disqualified from crop insurance benefits for up to 10 years.

Except for the collection of Social Security numbers, these provisions were already within the authority of FCIC. For some provisions, such as adopting actuarially sound rates, FCIC had already begun a comprehensive premium rate reform and development of a nonstandard classification system prior to the 1990 Act.²

Actuarial Problems Facing FCIC

Federal crop insurance was initiated in 1938, under authority of the Federal Crop Insurance Act of 1938 (Kramer, 1983). During the late 1930's and 1940's, the program was criticized for its high costs and low participation. Legislation passed in 1947 limited the scope of the program and from 1948 to 1980, the Federal crop insurance program was run on an experimental basis. Between 1948 and 1980, county and crop coverage was limited. In 1948, fewer than 10 million acres were enrolled (fig. 1). Expansion was gradual over the next three decades to about 20 million acres by 1980.

The program was modified several times to limit FCIC exposure. For example, in high-risk areas where losses were deemed excessive, insurance was withdrawn. In some cases, premiums were raised and yield coverages were reduced. During this period (1948-79), the program ran a slight surplus (fig. 2).

Several other Federal disaster assistance programs were available during this period. Between 1933 and 1945, producers in disaster-designated counties were eligible for direct work relief, seed and feed loans, and other programs. In the 1950's, production and economic disaster loans, as well as emergency feed programs, were available to producers faced with natural disasters.

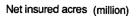
During the 1970's, disaster relief programs shifted in emphasis from loan, feed, and seed programs to direct payments. Under legislation passed in 1973, 1975, and 1977, producers of wheat, sorghum, corn, barley, upland cotton, and rice (program crop producers) could receive disaster payments if natural conditions prevented planting or reduced crop yields below a certain level (Dyson, 1988). Because producers had access to this disaster assistance free of charge, they had little incentive to buy crop insurance. As a result, total disaster payments between 1974 and 1981 exceeded \$3.8 billion.

The Federal Crop Insurance Act of 1980 (the 1980) Act) made crop insurance the primary form of disaster protection, replacing the disaster legislation of the 1970's for program crop producers. The 1980 Act authorized the expansion of crop insurance to all counties with significant agricultural production. To encourage participation, the Government subsidized up to 30 percent of total premium costs and provided indirect subsidies in the form of free delivery and administrative costs. Annual limits to program expansion, previously set at 3 commodities and 150 counties, were removed. Crop insurance coverage for program crops was rapidly expanded to counties where program crops were grown.³ By 1990, 51 crop policies were available. Total county programs (the national sum of crops covered in each county) exceeded 21,000, compared with fewer than 4,000 in 1979.

² The nonstandard classification system was developed to identify insured individuals with abnormal loss histories and to adjust their rates and coverage to mitigate the higher risk they represent. Insured individuals are selected based on loss frequency and loss severity.

³ Under the Agriculture and Food Act of 1981, direct-payment disaster assistance was available for producers in counties where crop insurance was unavailable.

Figure 1
Growth of Federal crop insurance program



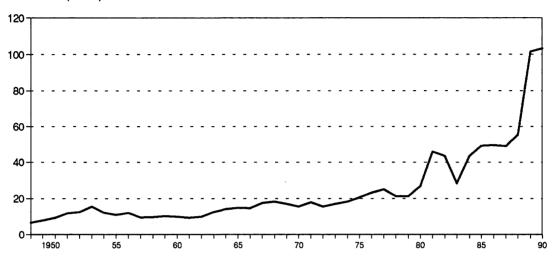
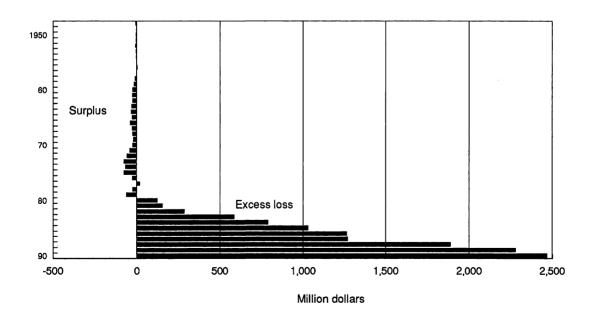


Figure 2 FCIC cumulative excess losses



Despite increased coverage and subsidies, participation in the crop insurance program grew slowly during the 1980's. By 1988, more than 55 million acres were insured, almost double the 1980 level, but some perceived this level as a disappointing 25 percent of eligible acreage. Widespread crop failures in 1988 and 1989 were partially responsible for an increase in participation to more than 100 million acres in 1989 and 1990.

Droughts resulted in disaster assistance acts in 1988 and 1989, which required that producers receiving disaster assistance payments for severe losses purchase crop insurance in the following crop year. A survey of approximately 2,500 farmers, conducted by USDA-ERS and the University of Maryland, suggested that about half of those who signed up for crop insurance in 1989 but not in 1988 were required to do so because they received disaster assistance payments in 1988. Other reasons for increased participation were low soil moisture levels in many regions and requirements by some agricultural lenders that borrowers purchase crop insurance.⁴

The growth in crop insurance participation during the 1980's was accompanied by large losses. Over the period 1981-90, total indemnities exceeded total premiums (the farmer-paid portion of premiums plus the Government-paid subsidy) by \$2.5 billion (fig. 2). The aggregate loss ratio (total indemnities divided by total premiums) was 1.5 for the period, compared with 1.1 for 1948-80.

Aggregate loss ratios mask the wide variation among crops and regions. Table 1 shows the composition of excess losses (losses in excess of the premium) by State and by selected crops for 1981-89. Excess losses for soybeans and wheat accounted for over half of total excess losses for all crops for that period. Of the excess losses attributable to wheat, Montana and North Dakota accounted for about 60 percent (\$367 million). Arkansas, Georgia,

Louisiana, and Mississippi accounted for 72 percent of total soybean excess losses (\$424 million). Texas alone accounted for 87 percent of total cotton excess losses (\$122 million).

Yet despite large overall losses, some States and crops ran surpluses over the period. Aggregate loss ratios for Hawaii, Iowa, Minnesota, Nebraska, New Hampshire, Oregon, Pennsylvania, Vermont, Washington, and Wisconsin were all under 1.0, far below the national average of 1.5. The combined actuarial experience for corn and soybeans in Minnesota and Iowa produced a surplus of more than \$100 million.

Table 2 shows the distribution of insured acreage for counties that had loss ratios in the stated ranges. About 60 percent of corn acreage and 51 percent of soybean acreage enrolled in crop insurance in 1989 were in counties with aggregate loss ratios for 1981-89 of less than 1.0. By comparison, only 16 percent of enrolled acreage for cotton and wheat were in counties with loss ratios of less than 1.0. Almost 32 percent of wheat acreage and over 25 percent of cotton acreage were in counties with aggregate loss ratios greater than 2.0.

Losses tend to be concentrated geographically. Figures 3-7 identify the counties where aggregate loss ratios over the period 1981-89 were less than 1.0, between 1.0 and 2.0, and greater than 2.0. For wheat, counties with loss ratios greater than 2.0 are widespread, with the heaviest concentration in Montana (fig. 3). For corn, the Midwest is characterized by counties with loss ratios less than 1.0 (fig. 4). For soybeans, loss ratios are generally under 1.0 for counties in the Midwest, but over 2.0 for counties in the Delta States (Arkansas, Louisiana, and Mississippi) and the Southeast (fig. 5). For cotton and grain sorghum, losses are concentrated in the Texas High Plains (figs. 6 and 7).

Benefits of the crop insurance program are even more highly skewed when viewed from the individual policy level. A small percentage of FCIC-insured individuals collected a disproportionate amount of the losses paid during the 1980's. While highly skewed distributions of indemnity payments

⁴ In the ERS-Univ. of Maryland survey, about 20 percent of those purchasing crop insurance in 1988 said they did so because of lender requirements (Hughes, 1990).

Table 1--FCIC excess losses by State, 1981-89

	Total	Total	Loss		Total excess losses by co				
State	premium	indemnity	ratio	Soybeans	Corn	Wheat	Cotton		
	1,00	00 dollars			1,000	dollars			
Alabama	83,169	154,142	1.85	49,477	2,941	4,442	-93		
Arizona	5,393	9,749	1.81	0	_,; 0	35	3,05		
Arkansas	110,185	265,714	2.41	127,412	355	6,701	91		
California	191,095	202,389	1.06	0	-82	5,204	-1,52		
Colorado	55,184	55,515	1.01	Ŏ	-4,616	-2,953	.,		
Connecticut	735	805	1.10	0	0	0			
Delaware	3,344	4,547	1.36	101	43	-198			
Florida	63,648	93,416	1.47	10,518	2,986	1,982	27		
Georgia	164,143	301,441	1.84	51,971	15,890	5,124	7,16		
Hawaii	279	0	0	0	0	0	.,		
Idaho	28,120	51,099	1.82	0	144	10,498			
Illinois	162,452	228,105	1.40	6,646	35,180	9,324			
Indiana	77,416	99,453	1.28	7,483	4,447	4,167			
lowa	410,405	374,983	.91	-29,487	-32,426	449			
Kansas	174,784	276,029	1.58	14,958	2,061	70,435			
Kentucky	52,090	82,396	1.58	3,871	6,399	399			
Louisiana	86,950	239,406	2.75	120,409	1,502	5,381	5,36		
Maine	3,944	6,268	1.59	0	59	11	-,		
Maryland	4,620	6,971	1.51	323	2,021	-9			
Massachusetts	1,073	1,569	1.46	0	108	0			
Michigan	22,995	57,033	2.48	2,159	1,902	577			
Minnesota	272,509	248,072	.91	-23,435	-32,248	19,994			
Mississippi	98,534	238,693	2.42	123,971	1,883	5,131	2,08		
Missouri	128,268	184,694	1.44	37,034	5,082	7,330	-30		
Montana	171,316	492,143	2.87	0	992	223,855			
Nebraska	263,998	243,070	.92	9,646	-43,158	10,183			
Nevada	65	288	4.43	0	0	225	-		
New Hampshire	28	23	.82	0	0	14			
New Jersey	2,325	4,546	1.96	377	13	25			
New Mexico	8,578	15,014	1.75	0	0	3,273	-14		
New York	4,527	5,921	1.31	26	852	39			
North Carolina	165,428	214,955	1.30	13,310	11,863	1,692	-1,11		
North Dakota	326,442	567,290	1.74	-74	17,269	143,553			
Ohio	38,965	51,195	1.31	4,710	5,064	303			
Oklahoma	49,400	92,181	1.87	12,291	1,071	10,719	3,25		
Oregon	12,528	8,887	.71	0	76	-4,017			
Pennsylvania	9,053	8,275	.91	138	-347	8	:		
Rhode Island	121	205	1.69	0	-3	0			
South Carolina	61,493	100,067	1.62	19,044	8,374	2,055	-13		
South Dakota	117,300	141,493	1.21	-4,270	-2,375	17,792			
Tennessee	18,937	29,114	1.54	3,062	638	841	-20		
Texas	315,903	606,857	1.92	27,006	27,195	40,236	121,96		
Utah	2,118	5,033	2.38	0	0	1,636			
Vermont	675	482	.71	0	-104	4			
Virginia	51,234	73,549	1.44	2,404	9,924	517	-1		
Washington	53,695	52,851	.98	0	-2	316			
West Virginia	1,092	2,833	2.59	23	421	16			
Wisconsin	32,019	30,799	.96	-113	-3,380	-1			
Wyoming	8,479	14,282	1.68	0	133	912			
Total	3,917,504	5,943,842	1.52	590,991	48,384	605,220	140,40		

¹ Losses to FCIC in excess of the premium. That is, total indemnities minus total premiums, where total premiums equal the producer-paid portion plus the Government-paid portion. A positive excess loss indicates that total indemnities exceed total premiums.

Table 2-Distribution of insured acreage for counties that had loss ratios in the stated ranges¹

Loss ratio	Corn	Wheat	Soybeans	Cotton	Sorghum	All crops
Average	1.08	1.83	1.74	1.54	1.81	1.52
•			Pe	ercent		
< 0.75	42.5	6.1	35.3	9.1	12.8	18.7
0.75 - 1.00	17.5	9.8	16.1	7.0	12.9	13.4
1.00 - 1.25	9.2	12.1	14.6	26.2	8.9	12.2
1.25 - 1.50	7.8	14.2	8.2	17.5	13.8	12.4
1.50 - 1.75	5.3	11.7	7.4	12.7	12.4	10.8
1.75 - 2.00	4.5	14.2	3.7	1.9	7.9	9.4
2.00 - 2.25	3.3	6.0	3.8	7.8	5.2	6.9
2.25 - 2.50	3.0	6.1	3.4	5.6	6.0	5.1
> 2.50	6.9	19.7	7.6	12.1	20.2	11.1

¹ Loss ratio reflects total indemnities divided by total premiums over the period 1981-1989. Acreages reflect 1989 participation. That is, percentages are calculated with respect to the 1989 acreage that was insured in each county.

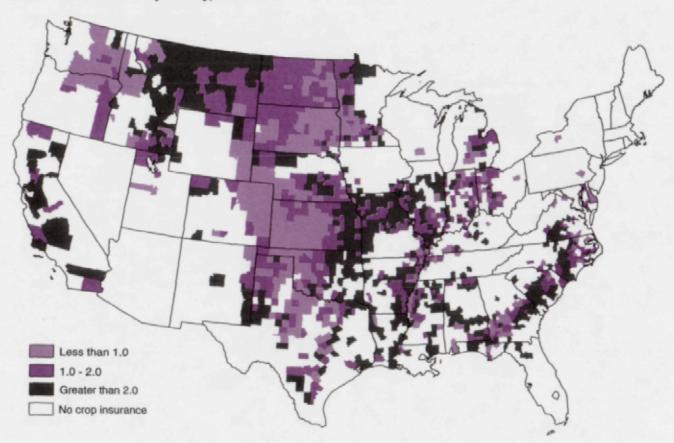
Table 3--Proportion of losses attributed to high-risk insured individuals with abnormal loss histories, 1983-90¹

Crop	Number of contracts	Total premium	Total indemnities	Total excess
	Number		Million dollars	
Soybeans	4,383	50.6	272.4	221.8
•	(1.4)	(8.1)	(23.4)	(41.3)
Wheat	4,554	33.7	139.7	106.0
	(2.2)	(5.8)	(12.4)	(19.5)
Corn	2,891	12.5	64.9	52.4
	(.7)	(.1)	(6.3)	
Cotton	778	9.6	33.0	23.4
	(1.5)	(3.1)	(8.1)	(23.2)
Grain sorghum	1,453	`5.1 [′]	34.3	29.2
J	(1.8)	(4.7)	(16.2)	(28.5)

^{-- =} Aggregate excess losses for all contracts were negative (that is, premiums exceeded indemnities).

¹ Percent of total contracts shown in parentheses. Experience based on 1983-90 data for all crops except wheat, which was calculated using 1983-89 data. High-risk insureds defined as contracts for which insured had at least 3 loss years and a loss frequency of 0.6 or greater. A loss year is defined as any year the insured collected an indemnity greater than the premium paid by the insured. Under this criterion, an insured with 5 years of experience would have to have at least 3 loss years.

Figure 3 Loss ratios for wheat by county, 1981-89



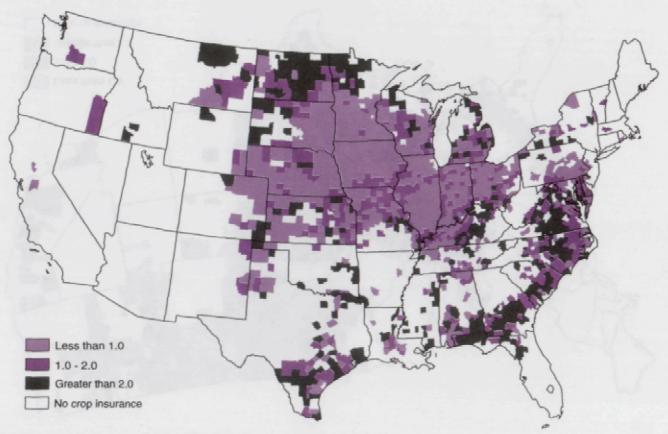


Figure 5 Loss ratios for soybeans by county, 1981-89

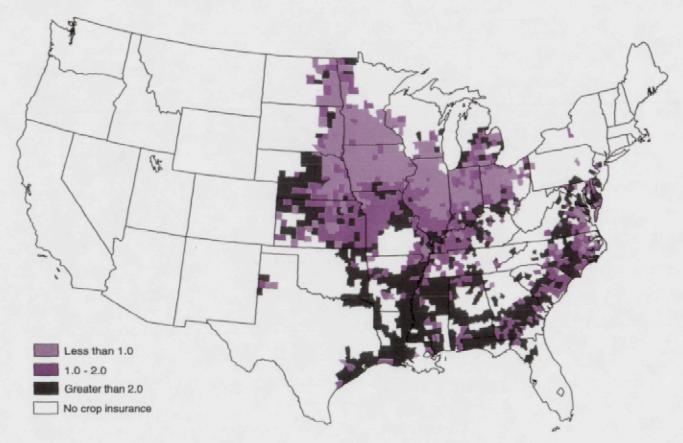


Figure 6 Loss ratios for cotton by county, 1981-89

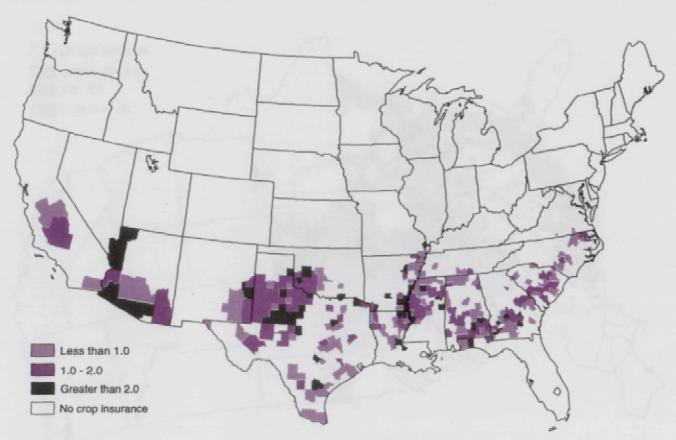
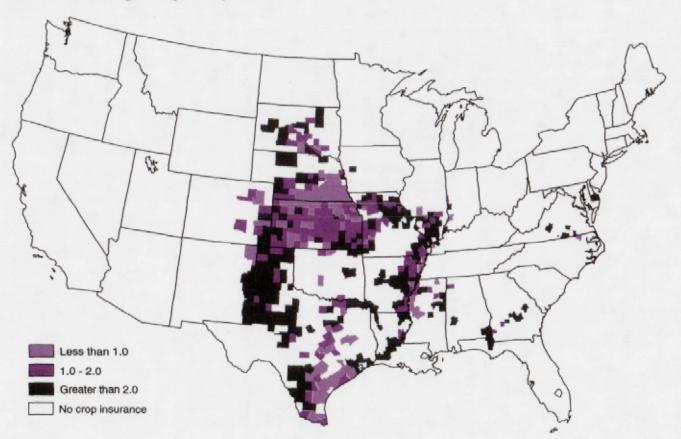


Figure 7 Loss ratios for sorghum by county, 1981-89



are not uncommon in other lines of insurance, crop insurance is unique in that a high proportion of indemnity payments are paid to a small number of policyholders. For example, over 40 percent of total excess soybean losses over the period 1983-90 were concentrated in 1.4 percent of soybean policies (table 3). This reflects \$221.8 million in excess losses. About 2 percent of wheat policies accounted for almost 20 percent of total wheat excess losses (\$106 million) over the 1983-89 period.

A number of implications can be drawn from this analysis. Over the 1981-89 period, some crops and regions benefited proportionally more than others. The aggregate county data suggest that Louisiana soybean producers received, on average, \$4.12 for every dollar of premium they paid. Over the same period, Iowa corn producers received, on average, less than \$0.90 on the dollar. For a given year, such disparity would not be viewed as atypical. Such diversity provides a means of pooling loss experiences. Rather, it is the persistent nature of the losses that points to the fundamental actuarial and underwriting problems underlying the current program.

The poor actuarial performance of the Federal crop insurance program during the 1980's can be attributed to several factors:

Rapid expansion of the program following passage of the 1980 Act. Under the 1980 Act, crop insurance was intended to replace standing disaster assistance as the primary form of disaster protection. However, the rapid expansion that followed passage of the 1980 Act unquestionably exacerbated actuarial problems. Lack of historical data to support new product development led to underwriting errors and flaws in product design.

Southeastern soybeans perhaps best exemplify this problem, but other problems have included safflower in California, cranberries in the northern Great

Plains, and fresh market tomatoes and peppers in Florida. Grower pressure often makes it difficult to withdraw or alter policies once in place.

Nor has pressure to expand abated. For example, over the period May 1989-October 1990, FCIC received requests to expand coverage to more than 50 new crops, including rapeseed, buckwheat, catfish, and kiwifruit. Requests for new crops and counties would add over 1,000 county programs.⁶

<u>Widespread drought</u>. Three major national droughts (1983, 1988, 1989) and several more localized regional droughts occurred during the 1980's.

Adverse selection and moral hazard. Adverse selection and moral hazard problems characterize most insurance markets. Adverse selection in crop insurance arises because producers are better informed about the distribution of their own yields, and thus better able to assess the actuarial fairness of their premiums, than the insurer, who lacks access to reliable individual yield data and other relevant information (Skees and Reed, 1986). Producers who recognize that their expected indemnities exceed their premiums are more likely to purchase coverage than those whose premiums are high relative to their expected indemnity.

Moral hazard occurs when producers, after purchasing insurance, alter their production practices to increase their chances of receiving an indemnity (Chambers, 1989; Nelson and Loehman, 1987). As a result, the insurer's expected indemnity outlays rise, undermining the financial soundness of the program.

Accurately assessing the extent of adverse selection and moral hazard is difficult. However, the potential for adverse selection and moral hazard was exacerbated by the rapid program expansion that followed passage of the 1980 Act.

⁵ The \$4.12 is calculated by dividing the applicable loss ratio by 0.75. It is assumed that the average premium subsidy for all levels of coverage is 25 percent.

⁶ Under the 1990 Act, producers of minor oilseeds-including rapeseed (canola), mustardseed, sunflower, and safflower--are eligible for marketing loans. This has increased pressure on FCIC to expand coverage for these crops.

Fraud and program abuse. The General Accounting Office (GAO) has documented loss adjustment errors and a persistent pattern of overpayments during the 1980's. A GAO audit of 1985 experience found a 31-percent overpayment rate on reinsured claims (U.S. General Accounting Office, 1987).

Information on fraud, waste, and program abuse, while largely anecdotal, has been the subject of much public attention. One high-profile case involved waste and fraudulent claims on nonirrigated safflower acreage in several California counties in 1990.

FCIC was partly responsible for the California situation. In response to concerns raised by GAO, USDA stated that FCIC had erred in implementing the California safflower program. Nonirrigated policies had been offered in areas that had confronted 4 straight years of drought, the yield guarantee had been set too high, and the planting date was too late relative to normal precipitation (U.S. General Accounting Office, 1991).

Farmers who signed up for these nonirrigated policies also shouldered part of the responsibility for program waste. The FCIC deputy manager acknowledged that it is "extraordinarily difficult to conclude that good farming practices were followed, that the producers would have acted similarly in the absence of crop insurance, or that the objective was a safflower crop rather than a probable indemnity" (U.S. General Accounting Office, 1991). In addition, FCIC found instances of double-insuring safflower land near Sacramento.

Indemnity payments to California safflower growers for the 1990 crop were estimated at about \$15 million. In response, the FCIC deputy manager canceled the nonirrigated safflower program in six California counties in mid-1990.

Actuarial Reforms

Two major conclusions can be drawn from the previous discussion of the actuarial problems facing FCIC:

- The large and widespread losses of the 1980's necessitate increases in premium rates. These increases should reflect differences among crops and regions.
- Where possible, rate increases should be tailored to the individual policyholder. Large, acrossthe-board rate increases could be counterproductive if they drive out farmers with better actuarial records, leaving a smaller, more adversely selected pool of participants.

Even before passage of the Food, Agriculture, Conservation, and Trade Act of 1990, FCIC had initiated a number of reforms to reduce its actuarial problems. In 1986, in response to GAO audits and audits by the USDA Office of the Inspector General, FCIC created a compliance office to monitor reinsured companies' compliance with the Standard Reinsurance Agreement.⁸ Subsequent reviews by both GAO and USDA have shown declines in overpayments.

In 1989, FCIC began a comprehensive review of rates and by the fall of 1990 had implemented rate changes for 1991 fall-planted crops. Rates were increased by as much as 15 percent in some cropreporting districts and were reduced by as much as 5 percent in others.

⁷ These findings were not, however, based on a statistically valid sample.

⁸ Under the Standard Reinsurance Agreement, private insurance companies sell, service, and adjust the losses on policies they sell under their own names. FCIC provides reinsurance coverage as protection against most of the risk that could result from losses incurred by the companies and shares in any gains or losses with the companies.

Under Title XXII of the 1990 Act, FCIC was directed to adopt, as soon as practicable, rates and coverages that would improve the actuarial soundness of the program. To avoid immediate, extreme rate increases, the 1990 Act limits rate increases to 20 percent over the comparable rate of the preceding crop year.⁹

As required by the 1990 Act, FCIC compiled the target rates and rate changes needed to achieve actuarial soundness for selected crops and States (table 4). Rate increases differ widely by crop and region and reflect historical actuarial experience. Increases varied across States. For example, rates for wheat were generally targeted to increase in crop-reporting districts in the northern Great Plains, while rates in Kansas were generally to decrease.

In addition to overall rate changes, FCIC has developed a nonstandard classification system to identify high-risk insured individuals with abnormal loss histories. Policies meeting the selection criteria are flagged and subjected to an underwriting review by FCIC personnel.¹¹ Based on the review, the

insured's contract will undergo coverage and/or rate adjustments so the contract performs acceptably.

The authority granted in Title XXII of the 1990 Act for the collection of Social Security numbers from participants will better enable FCIC to track and identify candidates for nonstandard classification. The nonstandard classification system was implemented for soybean producers in 1991 and for wheat, corn, cotton, grain sorghum, and peanut producers for the 1992 crop year.

In the short run, nonstandard classification will affect only those producers who experience 3 loss years and at least a 60-percent loss frequency. Given the increase in participation since 1987, FCIC may still face significant loss exposure due to the 3-loss-year requirement. Over time, however, problem policies will become eligible for nonstandard classification, and hence, overall actuarial performance will improve.

Moves to raise rates and tighten policy terms through nonstandard classification will likely cause fewer farmers to participate. Estimated 1991 participating acreage is about 82 million acres, a nearly 19-percent decline from 1990. Total 1991 premiums are estimated at over \$735 million, a decline of about 12 percent. Declines in participation were sharp for certain areas and crops where premium rate increases were highest. Combined participating soybean acreage in Alabama, Arkansas, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina fell over 50 percent, from 2.5 million acres in 1990 to less than 1.2 million acres in 1991.

The decline in participation is not entirely due to the rate increases, however. Some producers who were required to purchase crop insurance in 1990 because they had received disaster assistance payments in 1989 may have decided not to participate in 1991. Better planting conditions, including higher soil moisture, may have discouraged participation as well. In addition, in the soybean States cited above, coverage was sharply reduced and acres planted to soybeans declined from earlier years.

⁹ Rates for individual policyholders could differ from changes in the area rate. Individual premium rates equal the area rate times the individual's yield span. The yield span accounts for differences in the level of yield. Rates are lower for producers who have above-average yields.

¹⁰ FCIC based rate changes on normalized loss histories from crop-reporting districts using a 20-year period (1970-89).

¹¹ The selection criteria for the nonstandard classification system are based on the insured's loss frequency and loss severity. To meet the loss frequency requirement, insureds must have at least 3 years where collected indemnities were greater than the premiums paid by the insureds (that is, 3 loss years) and have experienced such losses over 60 percent of the time (for example, 3 loss years in any of 3 years, 4 years, or 5 years would qualify). To meet the loss severity requirement, the loss severity for the crop experienced by the insured is compared with the loss severity for that crop for the State where the insured farms. If the discrepancy is too great, the insured meets the loss severity criteria.

Table 4--Summary of 1992 rates and target changes for selected States and crops¹

Crop/State	1992 rate	Target rate	Target change
	Dollars	\$100 of liability	Percent
Wheat:		·	
Kansas	12.66	11.71	-8
Montana	14.30	18.78	31
North Dakota	13.44	13.94	4
U.S. average ²	12.68	18.26	44
Corn:			
Illinois	8.01	10.26	28
Indiana	7.17	7.44	4
lowa	7.33	10.00	36
U.S. average ²	13.55	21.87	61
Soybeans:			
Arkansas	25.27	44.15	75
Illinois	7.34	7.02	-4
Louisiana	28.31	45.48	61
Mississippi	21.67	34.73	60
U.S. average ²	17.07	24.20	42
Cotton:			
Texas	23.90	24.76	4
U.S. average ²	21.07	22.27	6
Sorghum:			
Texas	19.12	28.96	51
U.S. average ²	14.18	38.20	169
_			

¹ Target rates and rate changes are those needed to achieve actuarial soundness.

As part of its actuarial reform, FCIC adjusted rates downward for crops and in areas where appropriate. For example, many Iowa counties experienced rate reductions for both corn and soybeans. These counties also experienced significant declines in participation.

Area-Based Crop Insurance an Alternative to Individual Coverage

The 1990 Act encouraged innovative policy development. One such program receiving considerable attention has been insurance based on area, rather than individual, loss (Barnaby and Skees, 1990; Miranda, 1991). As a result of this recent attention, FCIC approved a pilot area-based loss program, or Group Risk Plan, for soybeans in

September 1992. This pilot program focuses on 13 States where individual yield coverage for soybeans has been plagued by large FCIC losses and low farmer participation. The advantages and disadvantages of an area-based program, as well as selected empirical results, are presented in this section.

The problems that accompany individual-yield crop insurance (for example, adverse selection and moral hazard) have been known since the early days of the Federal crop insurance program. Halcrow, in his 1949 evaluation of Federal crop insurance, concluded that "individual yield insurance would work only under conditions so exacting that they would be found to a rather limited extent in American agriculture" (Halcrow quoted in Miranda, 1991). Instead, Halcrow proposed an insurance program based on area rather than individual yields.

² Not a weighted average.

Under an area-based crop insurance program, both indemnities and premiums would be based not on a producer's individual yield but on the aggregate yield of a surrounding region, say, the producer's county. Under an area-based program, participating producers would receive, in any given year, an indemnity proportional to the difference, if positive, between the area yield and a predetermined yield guarantee. Every participating producer in that area would receive the same indemnity per acre insured, regardless of the producer's own crop yield. All participating producers in the area would pay the same per-unit premium, by trigger yield and amount of protection.

Area-based crop insurance offers numerous advantages over individual-based crop insurance:

- Program would provide catastrophic coverage. Producers would receive coverage against widespread yield loss.
- Adverse selection problems would be minimized. Information regarding the distribution of area yields is generally available and more reliable than information regarding the distribution of individual yields. As a result, insurers could more accurately assess the actuarial fairness of premiums under an area-based policy.
- Moral hazard problems would be reduced. A producer could not significantly increase his or her indemnity by unilaterally altering production practices. To willfully increase the probability of receiving an indemnity payment, a producer would need to collude with other producers in an effort to reduce the area's aggregate yield. However, such collusive action would be difficult to sustain since a producer would always have the incentive to overproduce. By doing so, the producer could increase his or her own yield, and thus net returns, while gambling that other producers would not overproduce and that the area yield would be low enough to guarantee all colluders an indemnity payment.

- Higher coverage levels could be offered.

 Due to the lower incidence of adverse selection and moral hazard, area-based yield insurance could be offered with a lower deductible or fewer constraints on coverage levels. These program improvements could benefit many producers.
- Administrative costs would be lower than for a pure individual-yield program. Claims would not be based on individual yields, and verification of individual yield histories for setting premium rates would not be required.

Area-based insurance, however, has some potential shortcomings:

- Effectiveness depends on yield correlations. Since losses are not based on individual vields, the effectiveness of area-based coverage would depend on how well correlated the individual's yield is with the area yield. This could cause concern to lenders who have required borrowers to purchase crop insurance to protect loan collateral. However, in a recent study of farm-level data, Miranda (1991) demonstrates that, for most producers, lower deductibles and higher coverage under an area-based plan would outweigh the protection provided by an individual-based plan. Individual protection could be augmented with the purchase of hail insurance. 12
- Program may be perceived as inequitable.

 Because area losses may be uncorrelated with some individual losses, area-based insurance can result in some individuals receiving indemnities when they have no crop loss, while others receive no indemnities despite significant yield loss. To some, area-based insurance may resemble little more than a lottery.

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¹² Hail insurance is widely offered through private companies.

- payments. An area-based insurance program requires the well-timed availability of county-level yield data, which would be needed to make timely insurance payments. The National Agricultural Statistics Service of USDA collects county-level yield data for many crops, but preliminary estimates are typically not available until several months after harvest. More timely area-based yield data would likely require additional funds for data collection.
- Insufficient data would be a problem. Many counties report insufficient data upon which to calculate rates. Reliable estimates of yield variation for calculating crop insurance premiums may require rates to be based on aggregations of many counties. Yet, aggregating over too wide an area would likely reduce the effectiveness of area-based coverage.

Some have suggested combining the area-based plan with an individual-based crop insurance plan. Under such a program, participants would receive payments only if the area (for example, county) yield fell below a critical level. Payments, however, would be based on the individual's rather than the county's yield outcome. The Bush administration proposed a standing disaster assistance program much along these lines during the 1990 farm legislation debate (U.S. Department of Agriculture, 1990).

An area-triggered/individual-based program would have many of the same advantages as an area-based program. Moral hazard and adverse selection would be reduced compared with individual-based insurance.¹³ Paying producers for individual losses would address many of the concerns that an area-based program would be little more than a lottery.

An area-triggered/individual-based program would also suffer from many of the same weaknesses of either the individual- or area-based plans. Like a pure area-based program, farmers could have substantial losses and not qualify for payments if the county trigger had not been met. Once a county triggered, farmers in adjoining counties would likely press for eligibility as well. And, like a pure individual-based program, individual loss assessments would be required. However, administrative costs would likely be lower than for a pure individual-yield program.

An area-triggered/individual-based program would likely be more difficult to assess for ratemaking purposes than either area-based or individual-based crop insurance since premiums would reflect the covariance between individual yields and county yields. The actuarial base is at present insufficient to properly rate individual farms. Thus, it is likely that adverse selection problems would still exist. Underestimating the covariance between individual and county yields would encourage participation, while overestimating covariance would discourage participation. A high deductible on the county trigger would discourage adverse selection, but would also reduce the appeal to producers who seek risk protection.

Table 5 shows the frequency of loss for counties producing corn, wheat, soybeans, grain sorghum, and upland cotton during the 1980's. The table shows the percentage of counties where county yields fell below 90 percent of the trend-adjusted expected yield for that year. For example, in 1988, over 72 percent of corn-producing counties, almost 50 percent of soybean-producing counties, and almost 40 percent of sorghum-producing counties would have been eligible for payments. Almost 40 percent of wheat-producing counties would have qualified in 1989.

To better understand how area-based and areatriggered/individual-based insurance could work, selected farm-level data from Illinois and Kentucky

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¹³ However, once it appeared likely that a county would trigger, the potential of moral hazard and fraud problems would likely increase.

¹⁴ A majority of farms covered by FCIC have fewer than 10 years of actual yield data.

Table 5--Percentage of counties where the county yield fell below 90 percent of the trend-adjusted, expected county yield¹

Year	Corn	Wheat	Soybeans	Grain sorghum	Cotton
			Percent of counties	3	
1980	59.3	18.2	51.6	79.5	84.9
1981	18.2	13.7	14.4	23.6	27.2
1982	10.8	22.1	8.0	16.6	23.0
1983	64.7	28.3	54.3	57.5	58.6
984	17.9	21.4	34.0	37.8	21.1
1985	8.4	30.2	12.3	6.8	8.3
1986	24.6	51.8	27.1	21.4	52.2
1987	17.7	29.2	20.4	16.4	15.4
988	72.3	32.8	49.0	39.5	33.3
989	23.4	39.2	23.7	47.5	38.5

¹ Yields are calculated on a planted-acre basis.

soybean producers were examined (tables 6 and 7). Soybeans were chosen for analysis because severe actuarial problems with that crop make soybeans a good test case for an area-based program.

In the analysis, three programs were compared: an individual-based program offering 75-percent individual-yield coverage, an area-based program offering 90-percent area-yield coverage, and an area-triggered/individual-based program offering 75-percent individual-yield coverage for counties with yields less than 90 percent of normal.

Individual and county rates were calculated from empirical data. The farms were drawn from a sample of farms enrolled in Farm Business Records Programs in Illinois and Kentucky. As such, the data are not random in a statistical sense and, hence, one must be careful in drawing conclusions about a broader sample. Given these qualifications, a number of points can be drawn:

• During the 1980's, a period of relatively high yield variability, a 90-percent area-based program (without an individual-based component) would have resulted in a more

stable revenue stream for farmers than a program offering 75-percent individual-yield coverage (table 6). More stable revenues would have been realized on 63 percent of the Kentucky farms and 77 percent of the Illinois farms under a 90-percent, no individual-based component, area-based program.

In addition, a 90-percent area-based program (either with or without an individual-based component) in the 1980's would have failed to trigger payments to less than 10 percent of the sample farms where reported yields were less than 75 percent of their normal yield levels.

• During periods of relatively low yield variability, such as in the 1970's, area-based programs are less effective in providing yield protection (table 7). Only 18 percent of Kentucky farms and 56 percent of Illinois farms during the 1970's would have had more stable revenue under a pure area-based program. With a 90-percent yield guarantee, area-based insurance (no individual-based component) would have paid for only 5.2 percent of the farms in Kentucky and 11.5 percent in Illinois during the 1970's.

Table 6--Coverage of area-based and area-triggered/individual-based insurance compared with individual-based insurance, Kentucky and Illinois, 1979-881

Item	Kentucky	Illinois
Number of farms	161	56
Percentage of observations where:	Perce	nt
•		
Area-based crop insurance pays (no individual-based component)	27.4	17.3
Area-triggered/individual-based crop insurance pays	16.1	7.9
Individual-based crop insurance pays	20.3	12.1
Area-based crop insurance (no individual- based component) pays when individual-based crop insurance does not ²	18.6	17.5
Area-based crop insurance (no individual- based component) pays when area- triggered/individual-based crop insurance does not ²	18.6	17.5
Individual-based crop insurance pays when area-based crop insurance (no individual-based component) does not ²	9.1	8.8
Individual-based crop insurance pays when area-triggered/individual-based crop insurance does not ²	9.1	8.8
Percentage of farms for which area-based crop insurance (no individual-based component) provides more risk protection than individual-based crop insurance	63.3	76.8
	Dollars p	er acre
ndemnity per acre: Individual-based Area-based (no individual-based component) Area-triggered/individual-based	6.25 7.52 5.21	3.56 5.31 2.87

¹ Area-based insurance based on 90-percent area-yield coverage; individual- based insurance based on 75-percent yield coverage; area-triggered/individual-based crop insurance based on trigger of 90-percent area yield and individual coverage of 75 percent.

² Includes only those observations where crop yield is below actual production history, which reflects the 10-year average farm yield.

Table 7--Coverage of area-based and area-triggered/individual-based insurance compared with individual-based insurance, Kentucky and Illinois, 1970-79¹

Number of farms Percentage of observations where: Area-based crop insurance pays (no individual-based component) Area-triggered/individual-based crop insurance pays	131 Pi 5.2	61 ercent
Area-based crop insurance pays (no individual-based component) Area-triggered/individual-based		ercent
Area-based crop insurance pays (no individual-based component) Area-triggered/individual-based	5.2	
(no individual-based component) Area-triggered/individual-based	5.2	
		11.5
	1.9	5.7
Individual-based crop insurance pays	13.7	9.5
Area-based crop insurance (no individual- based component) pays when		
individual-based crop insurance does not ²	4.8	10.5
Area-based crop insurance (no individual-based component) pays when area-		
triggered/individual-based crop insurance does not ²	4.8	10.5
Individual-based crop insurance pays		
when area-based crop insurance (no individual-based component) does not ²	24.7	8.1
Individual-based crop insurance pays		
when area-triggered/individual-based crop insurance does not ²	24.7	8.1
Percentage of farms for which area-based crop insurance (no individual-based component)		
provides more risk protection than individual-based crop insurance	18.0	55.7
	Dollai	rs per acre
ndemnity per acre: Individual-based	3.35	2.09
Area-based (no individual-based component) Area-triggered/individual-based	.40 .36	2.09 2.15 1.55

¹ Area-based insurance based on 90-percent area-yield coverage; individual- based insurance based on 75-percent yield coverage; area-triggered/individual-based crop insurance based on trigger of 90-percent area-yield and individual coverage of 75 percent.

² Includes only those observations where crop yield is below actual production history, which reflects the 10-year average farm yield.

Illinois farms would have fared better under an area-based program during the 1970's than Kentucky farms would have. This reflects the higher correlation between individual farm yields and county yields in Illinois. In almost 25 percent of the cases where Kentucky yields fell below the individual-yield guarantee, the area-based program did not pay. But area-based insurance failed to pay indemnities in only 8 percent of the cases where Illinois farm yields fell below their yield guarantees.

 Since area-triggered/individual-based insurance pays only when both the 10-percent area deductible and the 25-percent individual deductible were met, there were no cases where it paid and the other two programs did not.

The results presented here on area-based insurance are largely theoretical. While area-based insurance has been implemented for forage crops in Quebec and Sweden, there is little experience for area-based insurance for field crops such as wheat, corn, or soybeans. Little is known about the potential demand for area-based insurance.¹⁵

Conclusions

The significant effort underway to reform Federal crop insurance will likely reduce losses that characterized the program during the 1980's. Rate reform and nonstandard classification will allow FCIC to underwrite policies more effectively. Other provisions of the 1990 Act, such as the collection of Social Security numbers, will aid in identifying potential cases of fraud.

Rate reforms and nonstandard classification may result in decreased participation by growers of some crops and in some regions. This could lead to renewed pressures to pass *ad hoc* disaster legislation when widespread crop loss occurs.

Area-based insurance may provide insurers an alternative to individual-based insurance in areas where excess losses have been high and where participation is likely to fall with rate reforms.

Ideally, the area-based program would be tested on a pilot basis for crops and in regions where traditional, individual-yield crop insurance has performed poorly. The pilot area-based program for soybeans approved by FCIC in September 1992 is targeted in such a way. This pilot program focuses on 13 States where individual yield coverage for soybeans has been plagued by adverse selection and moral hazard, and has resulted in large FCIC losses and low farmer participation.

The yield protection offered by an area-based program, along with its reduction in adverse selection and moral hazard when compared with individual-based coverage, indicates that such a program merits further study and observation.

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New State Rankings by Receipts from **Agricultural Commodities**

Number 3, December 1992

attle and calves, dairy products, corn, hogs, and soybeans were the leading agricultural commodities (in terms of farm cash receipts) in 1991. Those commodities had the same ranking in 1990. The leading States for each commodity were as follows:

- Cattle and calves: Texas, Nebraska, Kansas, Colorado, and Oklahoma.
- Dairy products: Wisconsin, California, New York, Pennsylvania, and Minnesota.
- Corn: Illinois, Iowa, Nebraska, Indiana, and Minnesota.
- Hogs: Iowa, Illinois, Minnesota, Nebraska, and Indiana.
- Soybeans: Illinois, Iowa, Minnesota, Indiana, and Ohio.

Those findings come from a new report by USDA's Economic Research Service, Ranking of States and Commodities by Cash Receipts, 1991. One set of tables lists the 25 leading agricultural commodities produced in each State and the United States, ranked by value of cash receipts. Another set of tables lists the major producing States for each of the 25 leading commodities and for several major commodity groupings.

Thirty States had livestock receipts exceeding crop receipts in 1991. In 13 States, the majority of receipts was from sales of a single commodity, indicating a high degree of dependence on the production and market conditions for that commodity.

Commodity Dependence

In 11 States, one livestock commodity had receipts for more than 50 percent of the State's total receipts. Wyoming showed 73 percent of its agricultural receipts as coming from cattle and calves; Kansas, 62 percent; Colorado, 60 percent; Oklahoma, 58 percent; Nebraska, 54 percent; Nevada, 51 percent; Texas, 51 percent; and New Mexico, 50 percent. Dairy accounted for 72 percent of receipts in Vermont and 52 percent of receipts in Wisconsin. Delaware relied on broilers for 63 percent

of receipts. In two States, greenhouse/nursery products accounted for more that 50 percent of the State's total receipts: Alaska (57 percent) and Rhode Island (55 per-

Agricultural Diversity

Eight States had sufficient diversification in their agricultural production that the leading commodity accounted for no more than 20 percent of sales receipts. The States and their two leading commodities were: California, dairy (14 percent) and greenhouse (11 percent); Oregon, cattle (18) and greenhouse (15); Florida, oranges (19) and greenhouse (16); South Carolina, tobacco (16) and cattle (11); Minnesota, corn (18) and dairy (17); Virginia, cattle (20) and broilers (15); Ohio, soybeans (20) and corn (20); and Washington, apples (20) and dairy (14).

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